



Appellants' Second Supplemental Brief on Appeal  
S/N: 09/626,946

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of

Ex Parte Dietrich, et al.

Serial No.: 09/626,946

Group Art Unit: 3625

Filed: July 27, 2000

Examiner: Y. Garg/G. Akers.

For: METHOD FOR DETERMINING THE SET OF WINNING BIDS IN A  
COMBINATORIAL AUCTION

Commissioner for Patents  
Alexandria, VA 22313

**APPELLANTS' SECOND SUPPLEMENTAL BRIEF ON APPEAL**

Sir:

On August 13, 2003, Appellants timely filed an Appeal Brief for the final rejection of claims 1-20 in the Office Action dated February 13, 2003. A Notice of Appeal had been timely filed on June 13, 2003.

In the Office Action, dated November 24, 2003, Examiner Akers reopened prosecution.

On January 20, 2004, Appellants filed a Petition Under 37 C.F.R. §1.181 to Reinstate Appeal.

On August 25, 2004, Appellants' representative called Examiner Akers to request a status of the Appeal process. Examiner Akers indicated that he had allowed the case and that the Notice of Allowance would be forthcoming.

On November 10, 2004, Appellants' representative again called Examiner Akers for status of the Notice of Allowance. Examiner Akers again indicated that he had allowed the Application but that it was currently held up in review.

On March 3, 2005, Appellants' representative sent a formal Status Inquiry Letter requesting a status of the Application.

On April 29, 2005, Appellants received an Office Action from a different Examiner, Y. C. Garg, which new Examiner indicated in the Office Action that prosecution was reopened. Appellants file concurrently herewith a second Petition Under 37 C.F.R. §1.181 to Reinstate Appeal.

As best understood under current Appeal procedure, this Second Supplemental Brief on Appeal is necessary as a response to the new Rejection in this new Office Action dated April 29, 2005. Appellants' response begins on the next page.

The contents of the Appeal Brief that was filed on August 13, 2003, are unchanged by this new Examiner's reopening of prosecution and the arguments therein do not require any updates. The claims that were presented as an Appendix to this earlier Appeal Brief filed on August 13, 2003, are attached hereto, as confirmation of the claim language considered in the following response as being the claims currently under review.

### **Appellants' Response to the Office Action dated April 29, 2005**

In the Office Action dated April 29, 2005, claims 1-8 and 11-16 stand rejected under 35 USC § 101 as directed to non-statutory subject matter. Claims 1-3, 5, 9, and 10 stand rejected under 35 USC § 102(b) as anticipated by Rothkopf et al., "Computationally Manageable Combinatorial Auctions", DIMACS Technical Report 95-09, April 1995. Claims 4, 6, 8, and 11-20 stand rejected under 35 USC § 103(a) as unpatentable over Rothkopf, further in view of US Patent 6,272,483 to Joslin et al. Claim 7 stands rejected under 35 USC § 103(a) as unpatentable over Rothkopf, further in view of Joslin, and further in view of Pekec, "The Auction Needs a Foolproof Rule for Breaking Ties."

#### **I. The Rejection Based on 35 U.S.C. § 101**

##### The Examiner's Position

The Examiner raises the rejection, for the first time during prosecution, that the claimed invention is directed toward non-statutory subject matter under a new "two-prong" test that the Examiner considers was not discussed in *State Street* because that case was "... *already determined to be within the technological arts under the Toma test.*" As best understood, the Examiner alleges that the reason that the *State Street* Court did not address the "two-prong" test is that the *State Street* invention implemented a "... *computerized system for determining the year-end income, expense, and capital gain or loss for the portfolio.*"

As best understood, the Examiner's rejection is based upon the Examiner's interpretation that the invention defined by claims 1-8 and 11-16 can read upon an individual performing the described limitation: "*All the items read could be data on a spread sheet, individuals analyzing data collected can do the generating of proposals, selecting of the set of proposals, informing the bidding results to the players, formulating of interger or linear programs, solving of the programs and constructing of the winning bids.*"

The Examiner cites *Ex parte Bowman*, 61 USPQ2d (BNA) 1669 (BdPatApp&Int, 2001).

Appellants' Response

Appellants submit that the distinction between *Bowman* and the present invention is clearly described in the holding itself of that case, since the Board of Appeals described the Bowman Application as “...*directed to nothing more than a human making mental computations and manually plotting the results on a paper chart....*” (Bowman, at 1671)

It is noted that claim 1 of *Bowman* recites: “... *physically plotting a point on said chart, said point being located at coordinates corresponding to said first and second total scores, respectively, and, using said chart in making at least one decision regarding the value of said intangible asset of interest.*”(Bowman, at 1670)

The Board stated: “*The physical aspects of claim 1, which are disclosed to be nothing more than a human manually drawing a chart and plotting point on this chart, do not automatically bring the claimed invention within the technological arts.*” (Bowman, at 1671)

Perhaps the key issue in that case was that Appellant Bowman actually did intend that the wording of “The Examination Guidelines for Computer-Related Inventions” be applicable to the method of manually drawing up a chart and analyzing the data. That is, Appellant Bowman argued that: “... *creating a chart and plotting a point thereon is ‘physical and has clear real world value’*”... and “... *that the claimed process clearly results in a physical transformation outside of a computer for which a practical application in the technological arts is either disclosed in the specification or would have been known to a skilled artisan.*” (Bowman, at 1671)

The facts of *Bowman*, as described in the Board's holding, include: “*The examiner responds that the noted guidelines are inapplicable here because appellant has not recited the use of a computer in either the specification or the claims.*” (Bowman, at 1671) (emphasis by present Appellants)

In the concurring opinion, J. Dixon wrote: “*With this recognition that abstract ideas which have not been applied in some manner (to something tangible; within the technological arts; with a computer; in a memory device or medium) to realize a “useful, concrete, and tangible result” ..., the Court in AT&T found that the claimed process, which*

*the district court "recognized that the claims require the use of switches and computers" was directed to statutory subject matter. The Court went on to find that it does not matter whether the claimed invention is directed to a process or machine and that the scope of 35 U.S.C. § 101 is the same for either claimed invention (since both were disclosed)... In the present application, the specification is silent as to the need for any apparatus to carry out the claimed process or to make the ultimate decision regarding the value of the intangible asset." (Bowman, at 1673)*

In contrast, the facts are quite different for the present invention. That is, in the present Application, the specification is replete with reference to a computer implementation (e.g., the second paragraph on page 3, the final sentence on page 5, the final two sentences on page 9, extending into the first paragraph on page 10, the entire page 13, and the entire discussion from page 15 through 27, with particular emphasis on the final paragraph on page 27).

Therefore, in complete contradiction to the facts of *Bowman*, the specification of the present Application leaves no doubt that it is directed to a computer or other electronic implementation.

Relative to the Examiner's interpretation that the claims could read upon a manual exercise of the steps described therein, Appellants respond that the confusion arises only because there are no words in the English language that distinguish whether the verb is performed by a computer processor or a human. That is, for example, the word "generating proposals" can apply to the scenario in which a human sits with a piece of paper and pencil and generates the proposals from data off a spread sheet, as well as the scenario intended by the discussion in the specification wherein an electronic device receives data stored electronically and generates these proposals.

However, Appellants submit that such alternate interpretation is, in this case and contrary to the facts of *Bowman*, due only to the interpretative choice of the Examiner, which choice is not supported by the specification, by reason of which Appellants submit that the Examiner's strained interpretation is not permitted

That is, Appellants submit that such interpretation that is clearly contrary to the description in the specification is not permitted, since, as explained in MPEP § 2111.01, the words of a claim “... *must be read as they would be interpreted by those of ordinary skill in the art.*” Appellants submit that the overwhelming reference in the specification, as identified above, requires that the interpretation of the wording be that of an electronic engineer or computer programmer as describing the action achieved by an electronic component or software module, rather than a human carrying out the process on a piece of paper, as the Examiner now suggests.

Accordingly, Appellants decline to even attempt to modify wording as suggested by the Examiner, particularly since the Examiner attempts to limit the implementation to a computer CPU, which is not intended, as clearly explained in the final paragraph on page 27, “... *any device or assembly of devices on which a finite state machine capable of implementing the flow charts shown in the figures can be used to enable the invention.*”

It is respectfully submitted that one of ordinary skill in the art, having taken the specification as a whole, would clearly understand the intended interpretation of the claim language. Moreover, Appellants submit that the USPTO fails to recognize, in its recent barrage of 101 rejections similar to this newly-raised rejection wherein each Examiner insists that claim language be interpreted as being executed by a human when the specification clearly indicates electronic implementation, that there is no need to raise these rejections and insist that claim language include phraseology equivalent to a “CPU generating ....”, since such electronic actor is already understood by one having ordinary skill in the art.

Moreover, as pointed out above, such limitation would be unduly limiting, since alternate electronic devices could be intended, as specifically stated in the final sentence on page 27 that any device could be used that incorporates a finite state machine capable of executing the actions shown on the demonstrated flowcharts.

Finally, it is brought to the attention of the Examiner and the USPTO that there is no practical benefit to the public in having each Examiner insist upon his/her unique wording deemed by that specific Examiner as satisfactory to overcome the inherent ambiguity of the English language. That is, non-statutory subject matter is reviewed *de novo* by the Court,

should litigation result for an issued patent, so that the wording uniquely imposed by each Examiner remains subject to the same review as the Appellants' original claim wording that was carefully chosen as intended to be interpreted by one of ordinary skill in the art in view of the specification. Indeed, as indicated above, each Examiner's uniquely personal wording preference might unduly constrain the intended meaning, as clearly illustrated in the present Application, wherein the Examiner expects Appellants to limit the invention as implemented on a device having a CPU.

Finally, as a closing thought for the USPTO related to the recent trend of this type of rejection, Appellants submit that the scenario that the current claim wording would be applied in future infringement against someone sitting in front of a computer and applying the method mentally or using a piece of paper is not a realistic scenario, since such infringement action would cause the Court to not only dismiss the action but also invalidate the patent as being non-statutory. Appellants submit that no patentee would bring an action knowing that the patent would thereby be declared as invalid. That is, the same protection relative to precluding patent protection for an "abstract idea" applies equally against enforcement of a patent. There is no need for the USPTO to pretend that its role is that of protecting a Federal Circuit judge from potential failure to recognize and dismiss an improper infringement action based on a patent owner attempting to enforce an abstract idea.

Therefore, given that the present Application clearly describes implementation by an electronic system, in complete contradiction to the facts of *Bowman*, and given the above explanation that no patent owner would realistically ever even attempt to apply language considered by the Examiner as being ambiguous in the sense that would invalidate the patent, Appellants respectfully request that the Examiner reconsider and withdraw this rejection that the claimed invention of claims 1-8 and 11-16 are directed to non-statutory subject matter.

## **II. The Rejection Based on 35 U.S.C. § 102(b)**

The Examiner alleges that Rothkopf anticipates the present invention defined by claims 1-3, 5, 9, and 10, pointing specifically to the last full paragraph on page 3.

Appellants respectfully disagree and submit that the rejection currently of record fails to meet the initial burden of a *prima facie* rejection for anticipation. Indeed, Appellants submit that the description to which the Examiner points clearly teaches against the method of the claimed invention.

That is, Appellants submit that, to one of ordinary skill in the art, the last full paragraph on page 3 of Rothkopf describes a scenario to clarify the “AUSM” computerized combinatorial auction procedure mentioned in the previous paragraph. As clearly stated in that previous paragraph, the bidding upon which the Examiner relies is actually a step that “... falls upon the bidders.”

Thus, these bids in the final full paragraph represent the bids of the next round of bidding in this scenario in which losing bidders submit a new bid based on their preferred combinations.

In contrast, the present invention eliminates this “next round” of bidding by generating proposals for such combinations from the original set of bids.

Therefore, contrary to the Examiner’s characterization, Rothkopf not only fails to teach this key concept of the present invention, but, more realistically, actually teaches against this concept.

The Examiner relies upon Joslin for demonstrating the use of integer programming techniques. However, even presuming the propriety of modifying Rothkopf with Joslin, this secondary reference fails to overcome the basic deficiency of the primary reference, as identified above.

Hence, turning to the clear language of the claims, in Rothkopf there is no teaching or suggestion of: “... generating proposals by utilizing the input data, each said proposal comprising a collection of bids that can be awarded to a player participating in the auction, said bids being actual bids made and being considered simultaneously....”, as required by independent claim 1. The remaining independent claims have similar language.

Therefore, Appellants submit that claims 1-3, 5, 9, and 10 are clearly patentable over Rothkopf, since the AUSM computerized combinatorial auction procedure clearly fails to generate proposals from the original set of bids.

Stated slightly differently, a key feature in the approach of the present invention over Rothkopf is that it performs additional computer processing of the bid list from each player to produce a list of proposals. The list of proposals contains the set of original bids, but also contains some (but not all) combinations of the bids.

Thus, if the items are A, B, C, D, E, and F, then a player's list of bids might be {A}, {B,C}, {C,D}, {E}, {E,F}. Generally, an auction will allow a player to win multiple bids, provided that those bids do not contain any items in common. If there are no addition constraints, then for this set of bids, the generated proposals for that player (which are the combinations of items that the player could win) would be {A}, {B,C}, {C,D}, {E}, {E,F}, {A,B,C}, {A,C,D}, {A,E}, {A,E,F}, {A,B,C,E}, {A,B,C,E,F}, {A,C,D,E}, {A,C,D,E,F}, {B,C,E}, {B,C,E,F}, {C,D,E}, {C,D,E,F}. Despite the fact that this is a longer list than the original bid list, working with proposals rather than actual bids allows the integer program to solve faster, despite being "larger" in terms of the number of decision variables.

Appellants submit that this feature of generating additional data items (e.g., "proposals", in the case of the present method) for an optimization problem of any sort would be counter-intuitive to one of ordinary skill in the art and, therefore, non-obvious, let alone doing so specifically for a combinatorial auction process and let alone doing so for purpose of simply determining a winner, without the additional factor of maximizing revenue.

Finally, it is noted, for the benefit of the Examiner that the rejection currently of record ignores the plain meaning of various claim limitations of various claims, as follows.

The rejection for claim 2 ignores that the claim language: "... at least one type that is specified for each bid, and wherein said generating proposals are limited to collections of bids from a player that are of the same type, and wherein said selecting a set of proposals is limited to sets that include at most one proposal for each player." The Examiner's interpretation is merely an arbitrary categorization of bids by the Examiner and does not reasonably satisfy the description of claim 2.

The rejections for claims 3 and 5 mischaracterize that the auctioneer in Rothkopf generates the proposals described in the last full paragraph on page 3. That is, it is up to the

bidders to provide a new bid in a subsequent round. Appellants also submit that evaluating all possible proposals is not even suggested in the discussion.

### **III. The Rejections Based on 35 U.S.C. § 103(a)**

The Examiner further alleges that Rothkopf, when modified by Joslin, would render obvious the present invention defined by claims 4, 6, 8, and 11-20.

Again, Appellants respectfully disagree.

First, as pointed out above, Joslin does not overcome the deficiency identified above that Rothkopf fails to generate proposals from the original set of bids.

Second, Appellants submit that the rejection currently of record is procedurally deficient for claim 6, since it seemingly is initially directed to Joslin but then inexplicably mentions Trick without providing an attempt to provide a proper motivation for this reference.

Third, and perhaps most important, Appellants submit that the rejection currently of record fails to meet the Examiner's initial burden, since one of ordinary skill in the art would consider that Joslin is not relevant in the prior art evaluation of the present invention. That is, although Joslin mentions earlier literature on column generation, Joslin itself is directed to an entirely different method of optimization that is, basically, the greedy algorithm, which has appeared in technical journals since at least as early as the 1800s, with a feedback loop that adjusts the priority of the elements based on the previous solution.

Indeed, Appellants do not consider the use of integer programming to solve combinatorial auctions as novel, and are very familiar with the work of this Rothkopf reference, as well as the other technical reports referenced by the Examiner.

Column generation is also well known, having been first used by the inventors' IBM colleagues approximately 40 years ago and now used to solve a range of very large problems. For example, Barnhart et al. discuss its computational benefits for some classes of problems, and Gamache discusses its application to a set of airline rostering problems. Mike Trick's tutorial provides a good summary of typical integer programming techniques, as well as providing a few examples.

Appellants submit that it is the use of column generation to speed solution time and to deal with the complicating constraints, such as “type constraint”, in a combinatorial auction that the present invention provides as one of its non-obvious contributions to the art.

The use of column generation is motivated by the fact that, for large auctions, or auctions with complex rules, the obvious integer programming formulation, which is the only one described in the Rothkopf DIMACS reference, often takes an unacceptable amount of time (e.g., elapsed time and CPU time on the computer) to solve. Rothkopf points out in his paper that most combinatorial auctions are difficult to solve, and describes a few classes that have a special structure that makes the obvious formulation computationally manageable. He does not address any alternate formulations.

Further, in the case described in the present Application, where there are additional constraints (e.g., the “type” constraint), the proposal formulation leads to much faster solution times, and, sometimes, more compact formulations. This is because the additional constraints, if included directly as inequalities in the integer programming formulation, tend to make the problem more difficult to solve.

In the example above, if it is supposed that bids {A}, {C,D}, and {E} are of type 1, bids {B,C} and {E} are of type 2, and {E,F} is of type 3, then the list of proposals is {A}, {E}, {C,D}, {A,C,D}, {A,E}, {A,C,D,E}, {B,C}, {B,C,E}, and {E,F}.

Other types of constraints, such as “at most 3 items per proposal”, “D and E not in the same proposal”, or “at least one of A, C, and E in each proposal”, can also be handled in the proposal generation phase, rather than being put directly into the integer program.

The second (“generating proposals ...”) step of claim 1 includes one or more of these concepts. Other independent claims are even more explicit.

Therefore, Appellants submit that, even if Rothkopf were to be modified in accordance with Joslin, the resultant combination would still not satisfy the plain meaning of the claim language.

Should the Examiner wish to present the rejection currently of record to the Board, Appellants suggest that the rejection be augmented to identify specific column and line numbers for each specific claim limitation, since the rejection is currently too cursory and

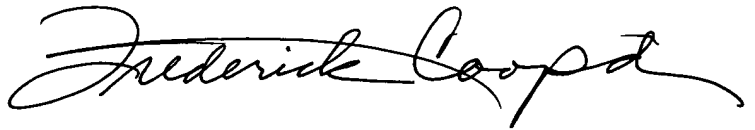
Appellants will point this out in the Appellants' Reply Brief to be submitted once the Examiner has completed the Examiner's Answer.

#### **IV. Conclusion and Summary**

In view of the above arguments and the arguments in the Appeal Brief, filed August 13, 2003, Appellants submit that claims 1-20, all the claims presently pending in the application, are sufficiently enabled and are clearly and patentably distinct from the prior art of record and in condition for allowance. Thus, the Board is respectfully requested to remove all rejections of claims 1-20.

Please charge any deficiencies and/or credit any overpayments necessary to enter this paper to Assignee's Deposit Account number 50-0510.

Respectfully submitted,



Dated: 7/29/05

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## APPENDIX

1. (Previously presented) A method for executing a combinatorial auction, the method comprising:

reading input data comprising:

a plurality of items;

a player bidding on the items; and

a plurality of bids, where each bid specifies the player bidding, the amount bid, and the list of items included in the bid;

generating proposals by utilizing the input data, each said proposal comprising a collection of bids that can be awarded to a player participating in the auction, said bids being actual bids made and being considered simultaneously;

selecting a set of proposals such that each item is included in at most one selected proposal; and

informing the players bidding on the items of the result of said selecting a set of proposals.

2. (Previously presented) A method according to claim 1, wherein said reading input data comprises reading input data further including at least one type that is specified for each bid, and wherein said generating proposals are limited to collections of bids from a player that are of the same type, and wherein said selecting a set of proposals is limited to sets that include at most one proposal for each player.

3. (Previously presented) A method according to claim 1, wherein said generating proposals comprises generating all possible proposals.

4. (Previously presented) A method according to claim 1, wherein said selecting a set of proposals is enabled by using an integer programming technique.

5. (Previously presented) A method according to claim 1, wherein said selecting a set of proposals comprises selecting a set of proposals that maximizes the total value of the bids included in the selected proposals.

6. (Previously presented) A method for selecting a set of bids in a combinatorial auction for at least two items involving at least one player and at least one type of bid for each player such that:

(a) each item is contained in at most one (or exactly one) selected bid;

(b) for each player, the selected bids all belong to the same type;

and among all collections of bids satisfying (a) and (b) the selected bids maximizing total revenue, said method comprising:

generating all valid proposals, said proposals comprising a collection of bids that can be awarded to a player participating in the auction, said bids being actual bids made and being considered simultaneously;

formulating an integer program that includes a column for each proposal, a constraint for each item and a constraint for each player, said constraints representing conditions (a) and (b) respectively, and an objective function which represents revenue;

solving the integer program for selecting the set of proposals that maximizes revenue;

and

constructing a set of winning bids from the set of winning proposals.

7. (Previously presented) A method according to claim 6, further comprising checking for ties by adding a constraint.

8. (Previously presented) A method for selecting a set of bids in a combinatorial auction for at least two items involving at least one player and at least one type of bid for each player such that

- (a) each item is contained in at most one (or exactly one) selected bid;
  - (b) for each player, the selected bids all belong to the same type;
- and among all collection of bids satisfying (a) and (b) the selected bids maximized total revenue, said method comprising:
- generating a set of valid proposals, each said proposal comprising a collection of bids that can be awarded to a player participating in the auction, said bids being actual bids made and being considered simultaneously;
  - formulating an integer program that includes a column for each proposal, a constraint for each item and a constraint for each player, said constraint representing conditions (a) and (b) respectively, and an objective function which represents revenue;
  - solving a linear programming relaxation of the integer program in said formulating an integer program for obtaining dual variables associated with each of the constraints;
  - using dual variables obtained in said solving a linear programming relaxation for determining the excess value associated with each bid, and a threshold for each player;
  - using a proposal generation method for selecting each player and type, a proposal for which the excess value exceeds the threshold, or determining that no such proposal exists;
  - adding the proposal generated in said using a proposal generation method and repeating said solving a linear programming relaxation, said using dual variables, and said using a proposal generation method until no new proposals are identified;
  - solving the integer program that includes all identified proposals; and
  - constructing a set of winning bids from the set of winning proposals.

9. (Previously presented) A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform method steps for executing a combinatorial auction, said method steps comprising:

- reading input data comprising:
  - a plurality of items;
  - a player bidding on the items; and

a plurality of bids, where each bid specifies the player bidding, the amount bid, and the list of items included in the bid;

generating proposals by utilizing the input data, each said proposal comprising a collection of bids that can be awarded to a player participating in the auction, said bids being actual bids made and being considered simultaneously;

selecting a set of proposals such that each item is included in at most one selected proposal; and

informing the players bidding on the items of the result of said selecting a set of proposals.

10. (Previously presented) A computer comprising:

(1) means for reading input data comprising:

a plurality of items;

a player bidding on the items; and

a plurality of bids, where each bid specifies the player bidding, the amount bid, and the list of items included in the bid;

(2) means for generating proposals by utilizing the input data, each said proposal comprising a collection of bids that can be awarded to a player participating in the auction, said bids being actual bids made and being considered simultaneously;

(3) means for selecting a set of proposals such that each item is included in at most one selected proposal;

(4) means for informing the players bidding on the items of the results in said means for selecting.

11. (Previously presented) The method of claim 1, wherein:

said selecting a set of proposals comprises constructing a constraint matrix, wherein the matrix has a row for each player, a row for each item, and a column for each of the proposals;

formulating an integer program from the matrix;

- solving the integer program with a subset of proposals from the matrix;
- creating a new proposals subset by adding proposals to the proposal subset if adding proposals to the subset will optimize the solution;
- solving the integer program using the new proposal subset;
- repeating the adding of proposals and the solving of the integer program until an optimal solution is determined.

12. (Previously presented) The method of claim 11, wherein said adding proposals to the proposal subset comprises using a proposal generation to generate the addition proposals until an optimal solution to the integer program is determined.

13. (Previously presented) The method of claim 6, wherein said solving the integer program comprises solving the integer program with a subset of proposals, said method further comprising:

- creating a new proposals subset by adding proposals to the proposal subset if adding proposals to the subset will optimize the solution;
- solving the integer program using the new proposal subset;
- repeating the adding of proposals and the solving of the integer program and until an optimal solution is determined.

14. (Previously presented) The method of claim 13, wherein said adding proposals to the proposal subset comprises using proposal generation methods to generate the addition proposals until an optimal solution to the integer program is determined.

15. (Previously presented) The method of claim 8, wherein the using of a proposal generation method comprises adding randomly generated proposals to the integer program.

16. (Previously presented) The method of claim 8, wherein the using of a proposal generation method comprises using a branch-and-bound method to search for additional proposals which, if added to the integer program, will optimize the solution.

17. (Previously presented) The program storage device of claim 9, wherein the generating of a set of proposals comprises constructing a constraint matrix, wherein the matrix has a row for each player, a row for each item, and a column for each of the proposals, said device further comprising:

- formulating an integer program from the matrix;
- solving the integer program with a subset of proposals from the matrix;
- creating a new proposals subset by adding proposals to the proposal subset if adding proposals to the subset will optimize the solution;
- solving the integer program using the new proposal subset; and
- repeating the steps of adding proposals and solving the integer program and until an optimal solution is determined.

18. (Previously presented) The program storage device of claim 17, wherein:

- step (2) for generating proposals comprises adding randomly generated proposals to the integer program.

19. (Previously presented) The computer of claim 10, wherein:

- means for generating a set of proposals comprises creating a new proposals subset by adding proposals to the proposal subset if adding proposals to the subset will optimize the
- means for selecting a set of proposals.

20. (Previously presented) The method according to claim 6, wherein:

- the subsets of new proposals obey the constraints within the integer program.